

CLAIMS

What is claimed is:

- 1 1. An ultrasonic transducer, comprising:
2 a plurality of micro-machined ultrasonic transducer (MUT) elements formed
3 on a first substrate, the first substrate including a first surface and a second surface;
4 and
5 a plurality of vias associated with each MUT element, where the vias reduce
6 the propagation of acoustic energy traveling laterally in the first substrate.

- 1 2. The transducer of claim 1, wherein the vias are etched into the first
2 substrate.

- 1 3. The transducer of claim 2, wherein the vias are etched into the first
2 surface of the first substrate and the second surface of the first substrate.

- 1 4. The transducer of claim 3, wherein the vias taper between the first
2 surface of the first substrate and the second surface of the first substrate.

- 1 5. The transducer of claim 1, wherein the first substrate comprises two
2 portions and the vias are etched into each portion so that each via is larger in diameter
3 at the second surface of each portion than at the first surface of each portion.

- 1 6. The transducer of claim 5, wherein the second surface of each portion
2 is joined together.

1 7. The transducer of claim 6, wherein the vias taper in diameter between
2 the first surface and the second surface of the first and second portions.

1 8. The transducer of claim 2, further comprising a second substrate joined
2 to the first substrate and wherein the vias are etched into the second substrate.

1 9. The transducer of claim 2, wherein the vias include a first portion
2 having a first diameter extending from the first surface of the first substrate toward the
3 second surface of the first substrate and a second portion having a varying diameter
4 extending from the second surface of the first substrate toward the first surface of the
5 first substrate.

1 10. A method for reducing the lateral propagation of acoustic energy in an
2 ultrasonic transducer, the method comprising the steps of:
3 forming a plurality of micro-machined ultrasonic transducer (MUT) elements
4 on a first substrate, the first substrate including a first surface and a second surface;
5 and
6 forming a plurality of vias proximate to each MUT element such that the vias
7 reduce the lateral propagation of acoustic energy in the first substrate.

1 11. The method of claim 10, further comprising the step of etching the vias
2 into the first substrate.

1 12. The method of claim 11, further comprising the step of etching the vias
2 into the first surface of the first substrate and the second surface of the first substrate.

1 13. The method of claim 12, further comprising the step of tapering the
2 vias between the first surface of the first substrate and the second surface of the first
3 substrate.

1 14. The method of claim 10, further comprising the steps of:
2 forming the first substrate in two portions, each portion including a first
3 surface and a second surface;
4 etching the vias into each portion so that each via is larger at the second
5 surface of each portion than at the first surface of each portion; and
6 joining the second surface of each portion together.

1 15. The method of claim 14, further comprising the step of tapering the
2 vias between the first surface and the second surface of the first and second portions.

1 16. The method of claim 11, further comprising the steps of:
2 forming a second substrate associated with the first substrate; and
3 etching the vias into the second substrate.

1 17. The method of claim 11, further comprising the steps of:
2 forming the vias to include a first portion having a first diameter extending
3 from the first surface of the first substrate toward the second surface of the first
4 substrate; and

- 5 forming the vias to include a second portion having a varying diameter
- 6 extending from the second surface of the first substrate toward the first surface of the
- 7 first substrate.